Metrology of Visibly Transparent Large Aspheric Optics

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The official link for this solicitation is:
http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml

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Description:

Aspheric optics represent the next generation in electro-optic sensor windows allowing for windows that conform to the local shape of an aircraft moldline, domes that reduce drag in missiles, and optical elements that correct for distortions produced by conformal windows and aerodynamic domes. The objective of this project is to develop metrology methods and hardware to measure the optical figure and transmitted wavefront error of large conformal windows, aerodynamic domes, and optical corrector elements to provide feedback for optical figure correction by an optics shop. Methodology development could begin with glass or fused silica specimens but is expected to move to spinel by Phase II. Possible candidate shapes include toroidal windows, tangent ogive domes, and arched optical corrector elements. Specimens to be measured are expected to have a footprint up to 24x24 inches. Metrology methods should have a precision of 0.1 micron or better. PHASE I: Evaluate the feasibility of measuring the optical figure and transmitted wavefront of aspheric optics including conformal windows, aerodynamic domes, and corrector optics. Demonstrate breadboard capability to precisely measure (0.5 micron) freeform shapes such as a 4x4 inch toroidal window provided by the government. Produce a design capable of measuring large aspheric optics up to 24x24x24 inches. Instruments that operate at visible or one micron wavelengths are acceptable. Measurement must be capable of handling optics with little to no symmetry. A method capable of measuring objects whose two surfaces deviate more than 5 degrees from parallel could be useful but is not required. PHASE II: Build and demonstrate the instrument designed in Phase I capable of measuring aspheric optics up to 24x24x24 inches. Specimens for measurement possibly made of glass or

plastic will be provided by the government. Measurement results must be in a form that provides feedback to an optical polishing shop for figure correction. The measurement goal is a precision of 0.1 micron or better. The intent for this instrument is to be used on the floor of an optics shop making large aspheric and conformal optics. PHASE III: Implement commercial metrology capabilities. Manufacture an instrument for sale to optics manufacturers to measure large aspheric optics. Alternatively, provide a commercial service to measure aspheric optics.